COTTAGE POLLUTION CONTROL PROGRAM

BELMONT LAKE

ROUND LAKE

CORDOVA (DEER) LAKE

CROWE (DEER) RIVER

NORTH RIVER

TWIN LAKES

COUNTY OF PETERBOROUGH

1977

Ministry of the Environment
Ontario

COTTAGE POLLUTION CONTROL PROGRAM

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BELMONT LAKE	-	BELMONT TOWNSHIP
ROUND LAKE	-	BELMONT TOWNSHIP
CORDOVA (DEER) LAKE	-	BELMONT TOWNSHIP
CROWE (DEER) RIVER	-	BELMONT TOWNSHIP
NORTH RIVER	-	BELMONT TOWNSHIP
TWIN LAKES	-	METHUEN TOWNSHIP

The field work outlined in this report was carried out by the Cottage Program staff of the Peterborough District Office, Municipal and Private Abatement Section.

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PREFACE

Ontario's thousands of beautiful inland lakes provide an abundant resource for recreational enjoyment. To protect the quality of these waters, a delicate environmental balance must be maintained.

A heavy influx of people may subject a lake and its surrounding environment to great stress. Uncontrolled development and imprudent use of our recreational lakes may cause their deterioration and destroy their natural qualities.

The Ontario Ministry of the Environment is attempting to bring some of these stress factors under control by a variety of programs: one of these, the Cottage Pollution Control Program was initiated in 1970 to study the cottage waste disposal problem, to evaluate existing waste disposal systems and to enforce repairs to those found to be unsatisfactory, and to educate the general public in matters pertaining to private sewage disposal.

The Ministry is also carrying on research to improve the knowledge of septic tank operation and the movement of sewage effluent in shallow soils. Alternative methods of private waste disposal are also being evaluated, and every year new toilet systems are brought onto the consumer market after testing by research staff to determine compliance with Ministry requirements.

SUMMARY

The Cottage Pollution Control Program was established to detect and correct faulty private sewage disposal systems of cottages on recreational lakes. The objective of the program is to locate faulty systems, and through cooperation with the owner undertake the required corrective measures.

During the summer of 1977 a total of 1,197 disposal systems serving cottages in recreation areas were inspected. They were located in Peterborough County on Belmont, Round and Cordova Lakes, all in Belmont Township; Twin Lakes in Methuen Township; and two river systems, the North River and Crowe (Deer) River, both in Belmont Township.

Of all these systems, 18.1% were found to be satisfactory; 27.3% were seriously substandard; 45.9% were nuisances (wash water or toilet wastes); 3.6% were polluting the lake or ground water, and 5.1% were unclassified at the time of inspection. (See Table I)

The various sewage-system types inspected were summarized. Out of a total of 1,197 disposal systems checked, 851 (71%) premises had piped water installed, and yet there were only 592 (49%) septic systems. Of the latter, 238 (40%) have been installed since 1970; 205 (35%) were installed during the 1960's, and 29 (5%) were installed prior to 1960. There were an additional 120 (20%) systems installed for which the owners could not give a date of installation. It should be

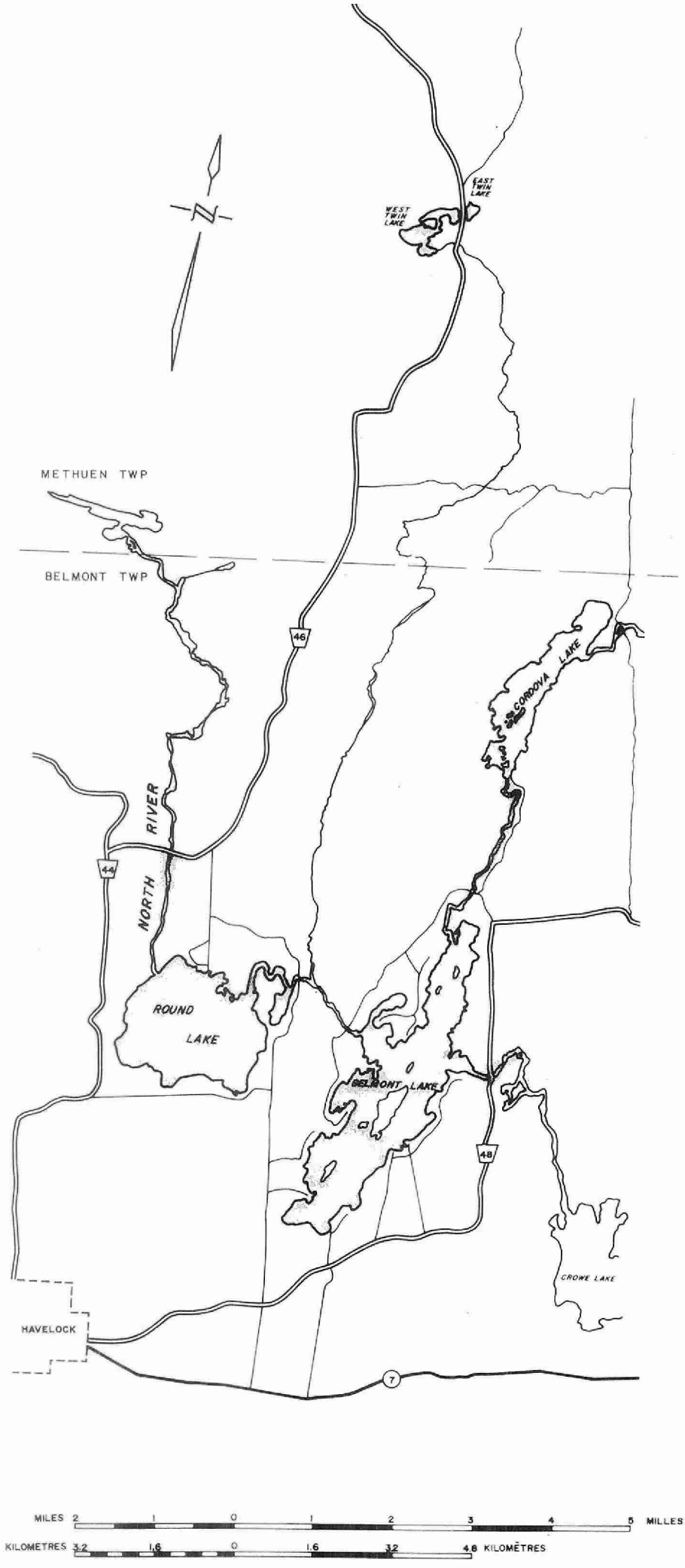

FIGURE 1 LAKES SURVEYED - 1977 COTTAGE PROGRAM.

noted that the Health Unit in Peterborough did not come into existence until the mid-1960's and, therefore, any septic tank systems installed prior to then (estimated at 130) were not approved by Health Inspectors.

459 outdoor privies were found to be still in active service. Some of these were the primary system for human waste disposal at a cottage, while some others were "back-up" systems used in conjunction with existing septic systems, i.e. in winter.

There were other types of toilet systems found as well; 39 holding tanks; 1 aerobic system; 35 cesspools; 9 incinerating toilets (gas or electric); 12 chemical toilets (Pail-a-day, or Pot Pourri, etc.); and 1 composting toilet (Humus-type).

A total of 327 cottage drinking water samples were collected. Of these, 34% showed presence of coliform bacteria, which are pollution indicators. A further 1,009 lake water samples were analyzed: 13% of these samples contained sufficient coliform bacteria to render the water unsafe for swimming.

Abatement work was carried out during and after the summer surveys. Out of 592 problem systems, (Nuisance - wash waste 366; Nuisance - solid waste 183; Polluters - 43) 257 were corrected by fall. Letters were sent out to 326 additional

TABLE I

PRELIMINARY CLASSIFICATION OF SYSTEMS INSPECTED

PETERBOROUGH DISTRICT - 1977

BODY OF WATER	NUMBER OF SYSTEMS INSPECTED	CLASSIFICATION OF SYSTEMS															
		SATISFACTORY		SATISFACTORY PERFORMANCE		SERIOUSLY SUBSTANDARD		NUISANCE (WASH WATER)		NUISANCE (SOLID WASTE)		DIRECT POLLUTER		UNCLASSIFIED TEMPORARILY		UNCLASSIFIED	
		NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
BELMONT LAKE	523	45	8.6	57	10.9	162	31.0	134	25.6	85	16.3	22	4.2	18	3.4	-	-
ROUND LAKE	243	16	6.6	54	22.2	70	28.8	60	24.7	25	10.3	11	4.5	7	2.9	-	-
CORDOVA LAKE	263	8	3.0	22	8.4	52	19.8	111	42.2	48	18.3	9	3.4	13	4.9	-	-
TWIN LAKES	88	2	2.3	4	4.5	23	26.2	33	37.5	12	13.6	-	-	14	15.9	-	-
CROWE RIVER	66	-	-	9	13.6	18	27.3	24	36.5	12	18.1	1	1.5	2	3.0	-	-
NORTH RIVER	14	1	7.1	-	-	1	7.1	4	28.7	1	7.1	-	-	7	50.0	-	-
TOTAL SURVEY	1,197	72	6.0	146	12.1	326	27.3	366	30.6	183	15.3	43	3.6	61	5.1	-	-

cottagers whose systems were classified Substandard and required upgrading in the future.

The abatement contacts during the summer, correspondence in the fall and winter, together with interviews held in Toronto, Oshawa and Peterborough resulted in more signed agreements for corrections to be done in 1978. Abatement contacts were also to continue in 1978 to visit those cottagers who could not be reached in 1977. Abatement work also continued on cottages inspected during 1975 and 1976; out of 262 cottages with outstanding problems, 229 have corrected their systems, and Agreements have been signed with 33 others to have the work done in 1978.

DESIGN OF THE SURVEY

Preparation

During the winter of 1976, Belmont, Round and Cordova Lakes were mapped during a snowmobile reconaissance program carried out by staff from the Peterborough office.

The snowmobile crews counted the total number of establishments on each lake, and described every one hundredth "control" establishment on the shoreline, plotted these cottages on maps and located non-cottage properties such as marinas, campgrounds and lodges.

Data obtained from the snowmobile work, as well as that from Cottage Owners' Associations and other agencies, was used to prepare a work schedule for the student crews.

Prior to the commencement of the summer surveys, a representative from the Program attended the spring meeting of each of the lakes' Cottage Associations. Members were given details of the pending survey, its procedure and format. An explanatory newsletter, prepared by the Ministry was distributed to the executive of each association for mailing to all cottagers with the spring "bulletin". In this way, the greatest possible cross-section of cottagers was notified of the survey to follow, whether Association members or non-members, whether attending the meetings or not.

Mid-season meetings, in some cases, were also held with

cottagers to explain corrective procedures and progress of the survey.

Detection Survey

Two crews, composed of two students each, began the survey of each lake by preparing the description log of cottages in which each establishment was systematically numbered and accurately described.

Each establishment on consecutive lakes was then inspected with regard to: type of disposal system, location and design, soil type in area of all tile beds, presence of leaching pits or privies; to provide data on nature and depth of soil, source of drinking water and other related factors.

A preliminary classification of all waste disposal systems was made by the students prior to turning over the file to their supervisor for final classification.

One additional student was assigned to the field office located at Baker's Bay Resort on Kasshabog Lake, where she undertook typing and filing duties, along with answering enquiries from the general public either over the phone or directly. An additional student with previous experience on the Program was designated an Assistant to the Abatement Officer, conducting re-inspections and dealing with cottagers who required corrections to their systems.

Classification of Sewage Disposal Systems

All premises surveyed were classified into one of the following groups:

1. SATISFACTORY - A system which meets all current standards of good design, construction and location, and is properly maintained.

2. SATISFACTORY (ACCEPTABLE) PERFORMANCE - A system which may not quite meet current standards of design and construction but is properly located with respect to lake, well, etc., and maintained in good condition.

3. SERIOUSLY SUBSTANDARD - A system which does not meet current standards of design, construction, and location and/or is in a state of neglect. The owner is notified of the deficiency and he is advised that consideration should be given to up-dating the system in the near future. Although this system is not deemed to be causing pollution at the time of inspection, a potential hazard exists.

4. NUISANCE (WASH WATER) - A system causing wash water to be exposed on the surface of the ground either directly through a waste pipe or escaping from a seepage pit or just thrown on ground surface. Wash water discharged from any sanitary fixture is contaminated and creates an unhealthy environment. Phosphates and other nutrients

from waste discharges encourage weed growth and affect the aesthetic quality of the lake.

5. NUISANCE (TOILET AND SOLID WASTE) - A system causing a waste containing faecal or urinary discharges to be exposed on the surface of the ground, either directly through a pipe or escaping from some part of a sewage disposal system including a privy. Also, included in this classification, is "solid waste" or garbage of a kind which can cause a "nuisance", e.g. domestic garbage containing foodstuff.

6. DIRECT POLLUTER - A system which is permitting sewage to contaminate the ground water, or to reach the lake either by direct discharge through a pipe or ditch or over the ground surface.

7. UNCLASSIFIED (TEMPORARILY) - A system which has been given a preliminary classification by the student inspector, but he cannot assign any of the preceding classifications and has doubts about the system or part of it. These systems require further inspections by the supervisor who will attempt to make a final classification after a thorough investigation.

8. UNCLASSIFIED - A system which still cannot be classified at the end of the survey. Usually these amount to only a few and include abandoned or ruinous premises.

WATER SAMPLING

The Public Health Laboratories in Peterborough provided the necessary water sample analyses to detect Total and Faecal coliforms in the lake water samples. These samples were important for the tracing of sources of pollution entering the lake. They were not taken in sufficient number of frequency to investigate the overall water quality of the lakes surveyed.

During the cottage survey, drinking water samples were obtained when the owner was using an untreated water supply. These samples were analyzed at the Public Health Laboratory and all owners having drinking water samples taken, were immediately informed by mail of the results and instructions were also sent regarding procedures for disinfecting the drinking water supply, if found unsatisfactory. Of 327 drinking water samples taken, 111 or 34% were found unsatisfactory, that is, containing total/faecal coliforms. (Table II)

Lake water samples were taken in front of each cottage at the dock or swimming area. The Ministry's booklet "Guidelines and Criteria for Water Quality Management, July 1974", states that where ingestion is probable, recreational waters can be considered impaired when the coliform, faecal coliform and/or enterococcus geometric mean density exceeds 1000, 100, and/or 20 per 100 ml. respectively, in a series of at

TABLE II

WATER SAMPLE RESULTS

1977

LAKE	LAKE WATER SAMPLES			DRINKING WATER SAMPLES		
	Total	Met Criteria	Exceeded Criteria	Total	Safe	Unsafe
Belmont Lake	445	396	49	162	121	41
Round Lake	191	171	20	62	37	25
Cordova Lake	208	188	20	59	36	23
Twin Lakes	82	64	18	22	13	9
Crowe River	72	50	22	14	6	8
North River	11	11	-	8	3	5
TOTALS	1009	87% of Total	13% of Total	327	66% of Total	34% of Total

Note: 1. The designations "Safe" and "Unsafe" are in accordance with the drinking water sample interpretation chart pamphlet "Understanding the Bacteriological Report on your Drinking Water", produced by the Ontario Ministry of Health.

2. No drinking water sample was taken if drinking water was being treated or brought from a municipal supply.

3. It should be noted that above Lake Water results were obtained from a single sample only.

least 10 samples per month, including samples collected during weekend periods.

Of 1009 lake water samples taken, only 129 or 13% did not meet these criteria; these results should not be interpreted to indicate overall lake water quality, as only a single sample was obtained in front of each cottage over the entire summer season.

ABATEMENT & CORRECTION PROCEDURE

Once the inspection crew completes the data form and sketch for a cottage premises, assigning a classification, the file is examined by the supervisor, and the original classification confirmed. The abatement officer then interviews the establishment owner where a problem has been found to advise him of the findings and discuss corrective action. If the owner agrees with the findings, a corrective program is initiated and the owner signs an abatement agreement form stating the corrections which would be completed by a specific date. A final inspection is carried out upon completion of the corrective work, and the sewage disposal system is re-classified.

In the case of commercial establishments, this procedure is often more complicated requiring an engineering study and the submission of plans for approval with soils analysis report. In these instances, unless he is a direct polluter, the owner is contacted and is instructed to submit plans for the corrective measures to be completed prior to the opening of the next commercial season. A direct polluter must take corrective action immediately to prevent pollution of the lake.

METHODS OF SEWAGE DISPOSAL

Much of the shoreline property in the Kawarthas has minimal soil cover over bedrock and thus is unsuitable, in its natural state, for sub-surface sewage disposal. This can be remedied in some areas by importing granular material over an area capable of supporting a sub-surface sewage disposal system. The use of a holding tank may provide a more economical solution for the disposal of sewage and may be recommended if a contract for the pump-out of the tank can be secured. On some lots where there is restricted space for a sewage disposal system, the installation of a proprietary aerobic sewage treatment system may provide a viable alternative.

Recently, there have been many developments in sewage disposal systems and the Ministry of the Environment is continually monitoring new systems being marketed in Ontario.

The Health Unit administering the septic tank program for the Ministry in the area must be consulted and approval obtained before any sewage disposal system is installed, altered, repaired or enlarged.

BELMONT LAKE

Belmont Lake is situated in Belmont Township, Peterborough County, approximately 5 miles (8 km) northeast of the Village of Havelock.

The terrain around the lake is hilly, with generally good drainage, in medium to coarse soil. This coarse soil is situated on a stony till with numerous bedrock outcrops. Soil depth varies with different parts of the lake shoreline between 1 and 3 feet.

Around the inlets of the Crowe and North Rivers, the shore is swampy, with heavy underbrush with a medium density of deciduous trees.

There are numerous islands on Belmont, the most prominent being Big Island, nearly 1 mile in length and ¼ mile wide at its widest point. Big Island has rugged features with very steep wooded slopes on the west side, moderate slopes on the east. Soil cover is very shallow over a conglomerate-based bedrock.

Belmont Lake has almost 3 sq. miles (1870 acres) of surface area; shoreline length is approximately 19 miles (29 km) as well as 6 miles, (9 km) of island shoreline. Maximum water depth is 60 feet (18 metres) with a mean depth of 30 feet (9 metres).

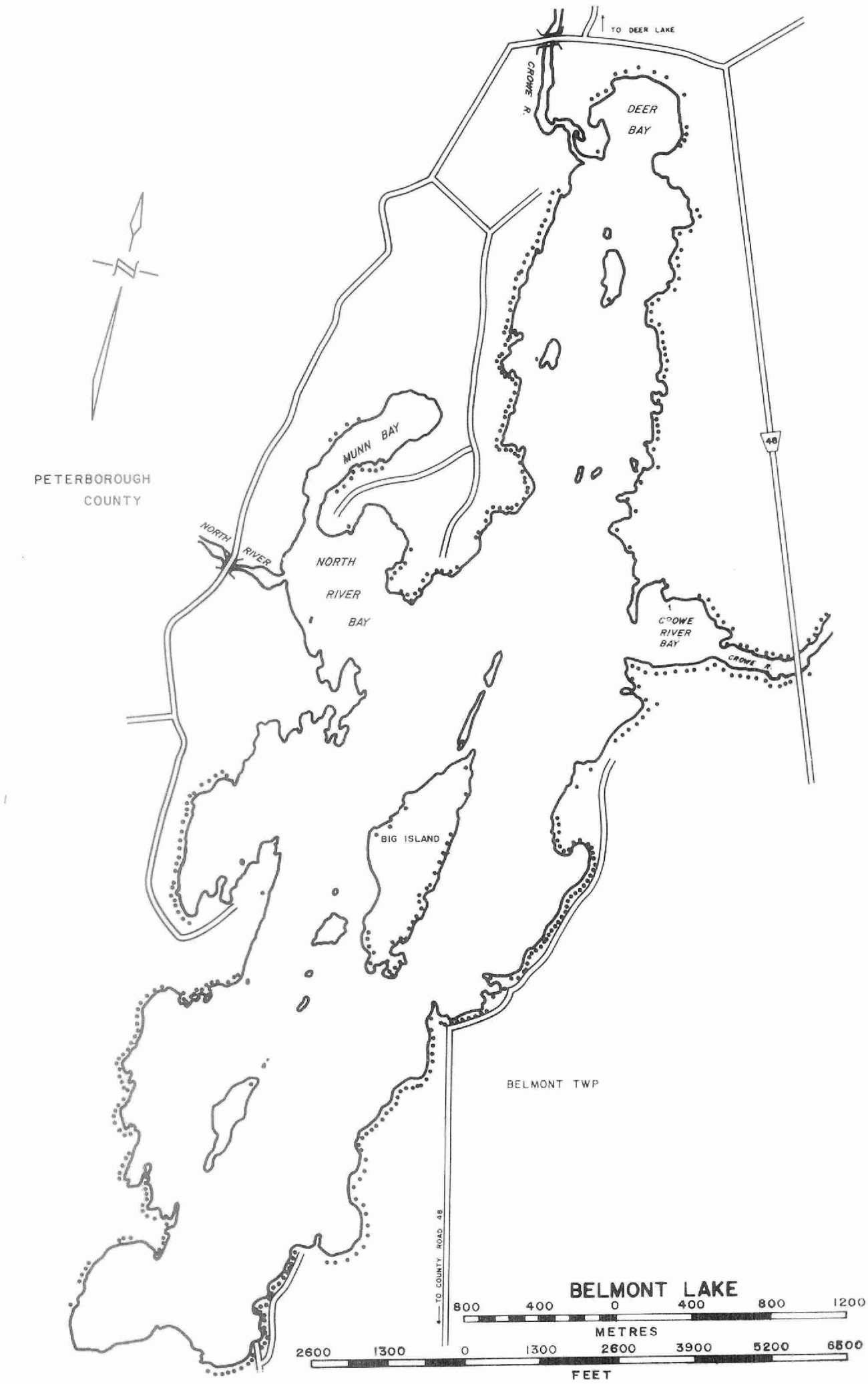

FIGURE 2 COTTAGE DISTRIBUTION ON BELMONT LAKE, 1977.

Belmont Lake is situated in the Crowe River Drainage Basin, which forms a part of the greater Trent River Drainage Basin. Excluding the area drained by the Crowe River, the immediate watershed of Belmont is about 14 sq. miles (35 sq. km). The Crowe River's head waters are at Paudash Lake; from there, the river drains many small streams and lakes, as well as Chandos, Wollaston and Cordova, before entering the north end of Belmont. The other inlet to the lake is the North River, whose head-waters originate in Kasshabog Lake, flow through Round Lake and enter Belmont Lake on its west shore.

Belmont's only outlet is the Crowe River which flows out on the east shore at the dam, and south towards Crowe Lake.

Water level fluctuation on Belmont has been a problem for cottagers for many years. In the spring, water levels have been 6 feet higher than summer levels, during extremely wet years. The new dam has eased these conditions very little, and much still depends on expedient management of water flows at peak periods.

Most of Belmont Lake's shallow bays are infested with the common weeds such as pondweed, coontail, pickerel weed and yellow water lily, but in recent years, a steady increase in growth of milfoil has been noted; heaviest vegetation appears to be found in the south end, in King and Sawmill Bays.

435 establishments on the lake had their sewage systems inspected; 32 of these were on islands. Guest cabins, resort cottages, etc. brought the number of actual sewage systems checked to 523. One marina was inspected, as well as two tourist resorts, a tent and trailer park, and two cottage-rental establishments.

Out of the 523 systems inspected, only 45 (8.6%) were classified Satisfactory; 57 others (10.9%) were Satisfactory Performance; 162 (31.0%) were Substandard; 134 (25.6%) were wash-water Nuisances; 85 (16.3%) were toilet or solid-waste Nuisances; 22 (4.2%) were found to be polluting the ground water table or the lake, while 18 (3.4%) were Unclassified at the time of inspection.

There were 445 lake water samples taken; of these, 396 show total coliforms less than 1000 per 100 ml. and faecal coliforms less than 100 per 100 ml. A further 162 drinking water samples were taken for analysis; 121 samples showed no presence of total or faecal coliforms. All those who had drinking water samples taken at their premises were advised of the anlysis results by mail.

Water Quality - Belmont Lake

In 1972, under the Recreational Lakes Program, a water quality survey was carried out on Belmont Lake. The bacteriological quality of the lake met this Ministry's criteria for body contact recreation during June, August and September of that year.

In 1977, under the Self-Help Program, it was noted that the mean Secchi Disc reading was 5.3 meters. Prior to this, readings had remained relatively constant, varying between 3.7 and 4.3 metres, indicating moderately enriched conditions. The increase in 1977, however, to 5.3 metres is indicative of an unenriched lake. The Ministry recommended that participation in this program be continued to determine whether there has been an improvement in lake water quality or if the increased transparency in 1977 was due to natural conditions.

Sewage Systems In Use: Type, Age, Etc.

On Belmont Lake 411 buildings had piped water systems, but only 311 had septic systems. Of these septics, 23 were installed before 1960; 118 were installed in the 1960's, while 123 have been installed since 1970; 47 other cottagers could not say when the system had been installed. It should be noted that, prior to the mid-1960's, there was no Health Unit, and hence no inspection of sewage systems.

205 outdoor privies were found to be still in use, either as the main sanitation facility, or a second system, for use in winter, or "emergencies". Other types of sewage systems found in use were as follows: chemical toilets - 3; incinerating toilets - 2; cesspools - 11; aerobic systems - 1; holding tanks - 17.

ROUND LAKE

Round Lake is situated in Belmont Township, County of Peterborough, approximately 6 miles (9 km) northeast of Havelock.

The surrounding area is generally flat with steep shoreline areas only along the south side, and consisting of limestone outcrops and ledges. Soil cover is fair to moderate in depth over limestone or shale bedrock. Extensive areas of shoreline along the west and northeast shore and low-lying and swampy, particularly around the inlet and outlet of the North River. There are a few small islands along the north shore; none are large enough to hold cottages.

Round Lake has a surface area of just over 2 sq. miles (1400 acres); shoreline length is about 8 miles (13 km). The maximum water depth is about 32 ft. (10 metres). Mean depth is approximately 17 ft. (5 metres).

Round Lake is part of the Crowe River/Trent River Drainage Basin. The North River, one of the major tributaries of the Crowe River, flows into Round Lake on the northwest side and exits through Sebright Bay to the northeast over the dam. Round Lake has two additional minor inlets, Beloporine Creek on the west side, and Whitney Creek which enters near Sebright Bay on the north shore.

FIGURE 3 COTTAGE DISTRIBUTION ON ROUND LAKE.

Water level fluctuations on Round Lake, though not as severe as on Belmont Lake, can vary as much as 4 feet between spring and summer levels. Generally, the dam at Sebright Bay limits fluctuations to 2-3 feet, and is managed by the Crowe Valley Conservation Authority.

Although shallow bays are abundant in growths of common aquatic weeds, no sightings of nuisance weeds such as milfoil were reported during the survey.

A total of 182 establishments were inspected on Round Lake (including Sebright Bay). There were no island cottages. Guest cabins, resort cottages, etc. brought the total number of sewage systems inspected to 243.

In addition to private cottages, also inspected were 2 marinas, 4 cottage resorts and numerous tent and trailer sites incorporated with the resorts.

Out of the total of 243 systems inspected, only 16 (6.6%) were Satisfactory, although a further 54 (22.2%) were Satisfactory Performance. Substandard systems amounted to 70 (28.8%); 60 (24.7%) of the systems involved wash water Nuisances; 25 (10.3%) involved toilet or solid waste Nuisances. There were 11 (4.5%) systems found to be Polluters, while 7 (2.9%) were initially Unclassified.

191 lake water samples were taken for analysis, as well as 62 drinking water samples. Out of the 191 lake water

samples, 171 contained total and faecal coliform counts of less than 1000 and 100 respectively per 100 ml. Out of the 62 drinking water samples analyzed, only 37 were entirely free of total and faecal organisms. All those cottage owners whose drinking water was tested were notified of the results by mail immediately after the analysis was done.

Water Quality - Round Lake

During 1977, Round Lake participated for the first time in the Self-Help Program. Secchi disc readings obtained varied between 2.3 and 4.0 metres, indicating moderately enriched water. Since this is but the first year of data being available, it is hoped that sampling will continue under this program, so that any long-term water quality trends can be defined.

Sewage Systems In Use: Type, Age, Etc.

184 buildings inspected on Round Lake had piped water; there were 130 septic systems. Of these septic systems, 4 had been installed prior to 1960; 53 were installed in the 1960's and 52 have been installed since 1970. The installation date of 21 others could not be determined from the owners.

There were 96 privies still in use, either as primary systems, or as a "back-up" system. Other sewage systems found were as follows: chemical toilets - 3; incinerating toilets - 2; cesspools - 10; holding tanks - 9.

CORDOVA LAKE

Cordova Lake, known also as Deer Lake, is situated in Belmont Township, County of Peterborough, about 12 miles (19 km) northeast of Havelock. A typical Precambrian Shield lake, it is surrounded by heavily wooded granite rock ridges with occasional poorly drained pockets of muskeg or beaver swamps. Soil overburden varies from moderate to very shallow, and consists of medium to coarse sand with some silty or clayey zones.

The Crowe River flows through Cordova, entering at the northeastern end of the lake, and flowing out at the south end, at the dam.

Total shoreline, including numerous islands, is approximately 12 miles (18 km). Maximum water depth is 49 feet (15 metres). Surface area is about 611 acres (.95 sq.mi.).

228 establishments were inspected during the course of the survey; 13 of which were on islands. Guest cabins, resort cottages, and trailer sites, etc. brought the total number of sewage systems to 263. Of these, only 8 (3.0%) were Satisfactory; 22 (8.4%) were Satisfactory Performance, and 52 (19.8) were Substandard. There were 111 (42.2%) wash water Nuisances, and 48 (18.3%) toilet or solid waste Nuisances. 9 systems (3.4%) were Polluters, while 13 (4.9%) were temporarily unclassified.

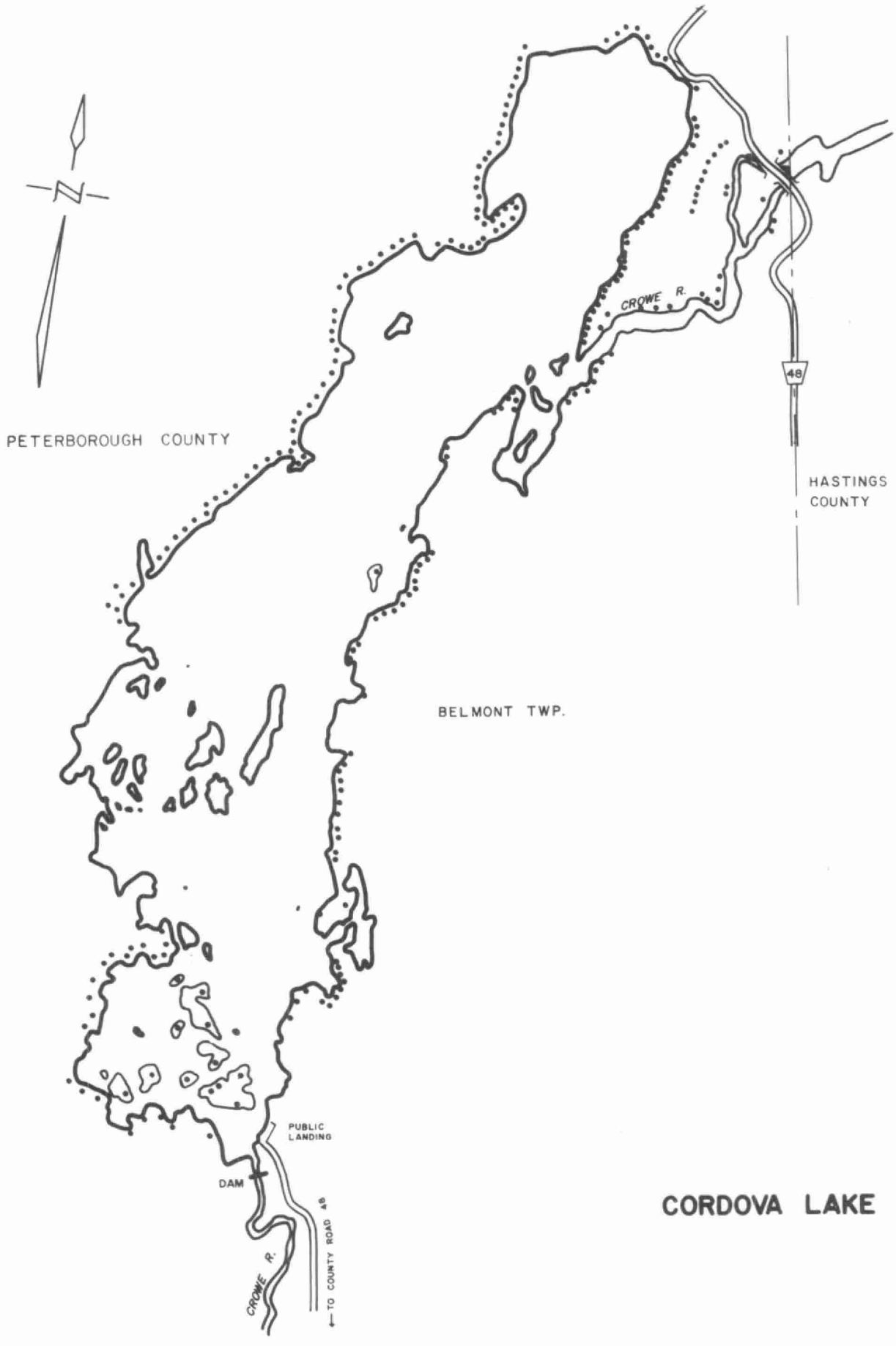

FIGURE 4 COTTAGE DISTRIBUTION ON CORDOVA LAKE.

Lake water samples, a total of 208, were taken for analysis; of these, 188 had total and faecal coliforms less than 1000 and 100 respectively per 100 ml. There were 59 drinking water samples taken, of which 36 were analyzed as having no total or faecal organisms present. All cottagers whose water was sampled, were notified of the results by mail.

Water Quality - Cordova Lake

In 1977, a Self-Help survey was undertaken, for the first time, on Cordova Lake. Unfortunately, samples were only taken on four occasions through the summer; however, based on the limited data available, the Secchi disc mean was 4.3 metres, which indicates a moderately enriched lake. It is hoped that the Self-Help survey will be continued in order that any long term trends in water quality may be identified.

Sewage Systems In Use: Type, Age, Etc.

Out of a total of 263 systems inspected on Cordova, 148 had piped water supplies, but only 89 had septic systems. 44 septic systems have been installed since 1970; 21 were installed in the 1960's; there were apparently none installed prior to 1960, while the installation dates of 24 systems were not knowm by the present cottage owners.

There were 161 privies still in use on Cordova Lake,

either as the primary system or as secondary or back-up systems. Other sewage systems found were: composting (humus-type) toilets - 1; chemical toilets - 5; incinerating toilets - 2; cesspools - 5; holding tanks - 5.

TWIN LAKES

Twin Lakes (East and West) are located in Methuen Township, County of Peterborough, approximately 17 miles (27 km) north of the Village of Havelock.

West Twin Lake, the larger of the two lakes, is separated from East Twin only by the width of the County Rd. #46 road allowance. Like Cordova, Twin Lakes are also Precambrian Shield lakes. Much exposed granite bedrock exists along its shores, and little or no soil exists on its rather steep shoreline and islands. The area surrounding Twin Lakes is characterized by much exposed bedrock and large expanses of swamp. Soil type is a medium to coarse sand and occurs in pockets up to a depth of two feet.

There is only one inlet to West Twin Lake, a stream on the northwest shore; the only outlet is at the southeast end of West Twin, and it is a branch of Otter Creek, eventually flowing into the North River just east of Round Lake.

Total shoreline for Twin Lakes is approximately 4.5 miles (7 km) including the shoreline of the few tiny islands in West Twin. Water depth is 40 ft. maximum (12 metres). Mean depth is 11 feet (3.3 metres).

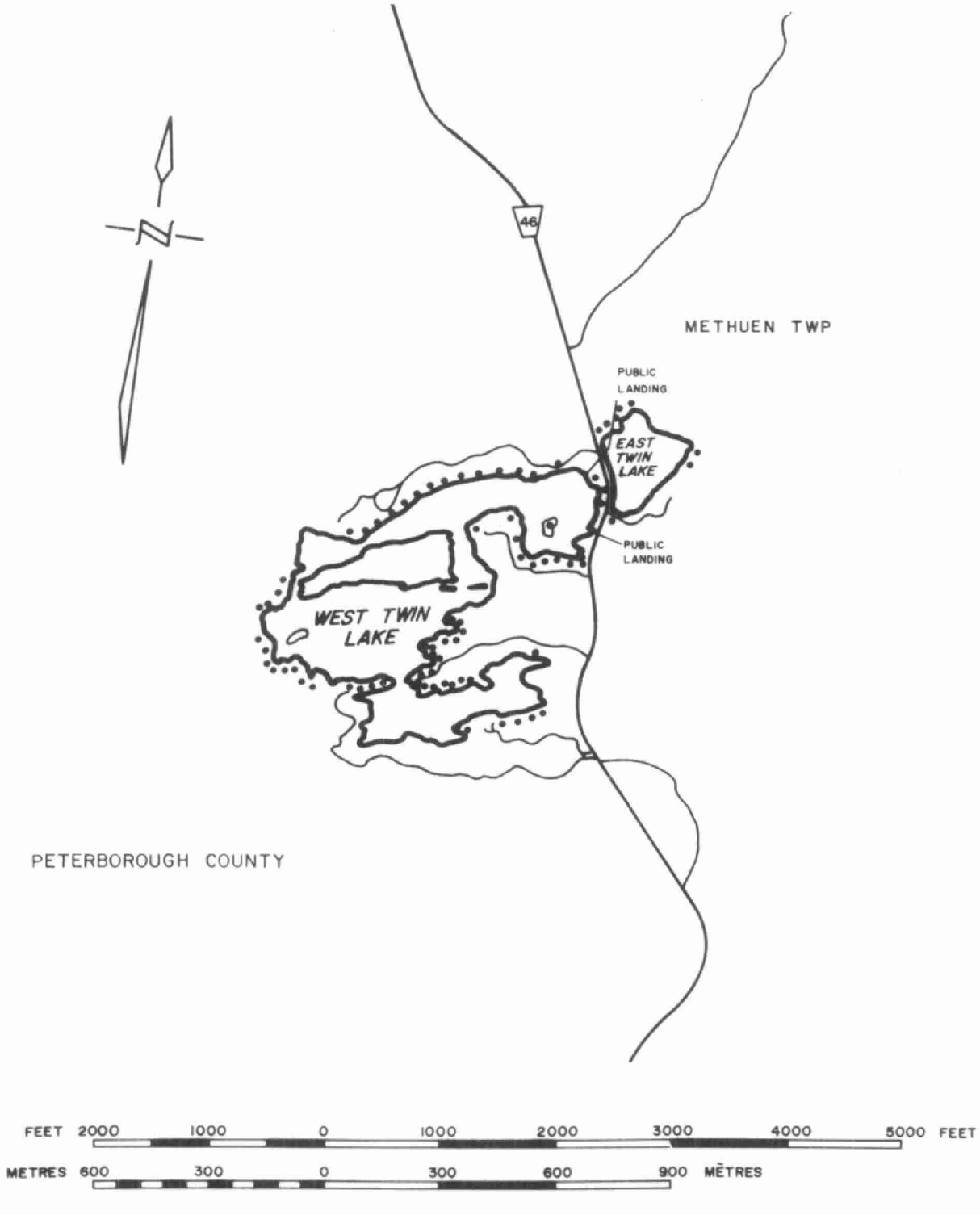

FIGURE 5 COTTAGE DISTRIBUTION ON TWIN LAKES.

Total surface area is about 120 acres. Water level fluctuations normally do not exceed about 2 feet.

There were 84 cottage establishments inspected on Twin Lakes; guest cabins, etc. accounted for a total of 88 sewage systems. There was only 1 cottage on an island. The only commercial development on the lakes is a hotel establishment on the southeast shore of East Twin Lake.

Out of 88 systems inspected, only 2 (2.3%) were classified Satisfactory; 4 (4.5%) were classified as Satisfactory Performance; there were 23 (26.2%) Substandard; wash water Nuisances accounted for 33 (37.5%) systems, and 12 (13.6%) solid waste Nuisances. There were no Polluters inspected; 14 (15.9%) systems were temporarily Unclassified.

82 lake water samples were taken for analysis; 64 of these samples indicated Total Coliform and Faecal Coliform counts less than 1000 and 100 per 100 ml. respectively. Out of 22 water samples collected at cottages with drinking water on tap, 13 samples indicated no presence of Total or Faecal Coliforms. Sample results were mailed to all those who had samples taken at their premises.

Sewage Systems In Use: Type, Age, Etc.

Out of 88 systems inspected on Twin Lakes, 66 had piped water, but only 26 had septic systems. Information supplied by the owners indicated that 7 have been installed since 1970; 4 had been installed in the 1960's; apparently none

were installed prior to 1960, while the installation date of 15 others were not known.

55 privies were found to be still in use, either as primary systems, or backup systems. Other sewage systems found were: chemical toilets - 1; incinerating toilets - 2; cesspools - 7; and holding tanks - 3.

CROWE RIVER AND NORTH RIVER

Crowe River

56 cottages and residences were inspected along a 2½ mile stretch of the Crowe River that connects Cordova Lake and Belmont Lake. A small store with associated rental cottages and trailer sites was also inspected. Total number of sewage systems inspected along the river amounted to 66. Of these 66 none were classified as Satisfactory; 9 (13.6%) were classed Satisfactory Performance; 18 (27.3%) were Substandard; there were 24 (36.5%) wash water Nuisances and 12 (18.1%) solid waste Nuisances; 1 (1.5%) system was a Polluter; 2 (3%) systems were temporarily Unclassified.

Out of 72 river water samples analyzed, 50 showed Total and Faecal Coliform counts to be less than 1000 and 100 per 100 ml. respectively.

Drinking water samples were taken where establishments had drinking water on tap; out of a total of 14 samples, only 6 showed no Total or Faecal Coliforms present. All those who had samples taken at their premises were notified by mail of their sample results.

North River

14 cottages and residences were inspected along a ½ mile stretch of the North River immediately south of County Road #46 (Twin Lakes Road). Out of 14 systems inspected,

only 1 (7.1%) was classified as Satisfactory; none were Satisfactory Performance; 1 (7.1%) was Substandard; 4 (28.7%) were wash waste Nuisances; 1 (7.1%) was a solid waste Nuisance; there were no Polluters, and 7 (50%) were Temporarily Unclassified.

11 river water samples analyzed; none had Total and Faecal Coliforms in excess of 1000 and 100 per 100 ml. respectively. Out of 8 drinking water samples taken where it was available on tap, only 3 showed no presence at all of Total or Faecal Coliforms. All cottages, where samples were taken, were notified by mail of the results.

Sewage Systems In Use: Type, Age, Etc.

80 establishments in all were inspected on the Crowe and North Rivers; 66 and 14 respectively.

On the Crowe River, there were 35 buildings with piped water, and 34 of these also had septic systems. 11 have been installed since 1970; 8 had been installed in the 1960's while 2 had been installed prior to 1960; the owners could not say when 13 others had been installed.

29 privies were found to be in use, as well as 1 cesspool, and 4 holding tanks.

On the North River, out of 14 systems, only 7 had piped water, and only 2 of these had septic systems. 1 had been installed in the 1960's and 1 has been installed since 1970.

13 privies were found, as well as 1 incinerating toilet, 1 cesspool, and 1 holding tank.

FOLLOW-UP ABATEMENT

On the lakes and rivers surveyed, 49.5% of all systems checked required some corrections whether minor like a leaching pit installation or privy relocation to major undertakings such as complete septic system installations. 592 systems in all, required correction; by the end of the summer, 505 signed agreements had been secured from cottagers to do corrections by one permanent Ministry Abatement Officer and an assistant working under his supervision. From these agreements, 257 systems had been corrected and reclassified by fall; the balance of agreements were to become due in 1978.

During the winter months, Ministry staff conducted interviews in Toronto, Oshawa, and Peterborough; an additional 15 agreements were secured for corrections falling due in the summer of 1978.

Approximately 22 cottagers remained to be contacted during the summer of 1978 for necessary corrections. Field revisits during that period are expected to reach all those premises where corrections are necessary.

INFORMATION OF GENERAL INTEREST TO COTTAGERS

MICROBIOLOGY OF WATER

For the sake of simplicity, the micro-organisms in water can be divided into two groups: the bacteria that thrive in the lake environment and make up the natural bacterial flora; and the disease-causing micro-organisms, called pathogens, that have acquired the capacity to infect human tissues.

The "pathogens" are generally introduced to the aquatic environment by raw or inadequately treated sewage, although a few are found naturally in the soil. The presence of these bacteria does not change the appearance of the water but poses an immediate public health hazard if the water is used for drinking or swimming. The health hazard does not necessarily mean that the water user will contract serious waterborn infections such as typhoid fever, polio or hepatitis, but he may catch less serious infections of gastro-enteritis (sometimes called stomach flu), dysentery or diarrhea.

Included in these minor afflictions are eye, ear and throat infections that swimmers encounter every year and the more insidious but seldom diagnosed, subclinical infections usually associated with several waterborn viruses.

These viral infections leave a person not feeling well enough to enjoy holidaying although not bedridden. This

type of microbial pollution can be remedied by preventing wastes from reaching the lake and water quality will return to satisfactory conditions within a relatively short time (approximately 1 year) since disease causing bacteria usually do not thrive in an aquatic environment.

The rest of the bacteria live and thrive within the lake environment. These organisms are the instruments of biodegradation. Any organic matter in the lake will be used as food by these organisms and will give rise, in turn to subsequent increases in their numbers. Natural organic matter as well as that from sewage, kitchen wastes, oil and gasoline are readily attacked by these lake bacteria. Unfortunately, biodegradation of organic wastes by organisms uses correspondingly large amounts of the dissolved oxygen. If the organic matter content of the lake gets high enough, these bacteria will deplete the dissolved oxygen supply in the bottom waters and threaten the survival of many deep water fish species.

RAINFALL AND BACTERIA

The "Rainfall Effect" relates to a phenomenon that has been documented in previous surveys of the recreational lakes. Heavy precipitation has been shown to flush the land area around the lake and the subsequent runoff will carry available contaminants including sewage organisms as well as natural soil bacteria with it into the water.

Total coliforms, faecal coliforms and faecal streptococci, as well as other bacteria and viruses which inhabit human waste disposal systems, can be washed into the lake. In Pre-Cambrian areas where there is inadequate soil cover and in fractured limestone areas where fissures in the rocks provide access to the lake, this phenomenon is particularly evident.

Melting snow provides the same transportation function for bacteria, especially in an agricultural area where manure spreading is carried out in the winter on top of the snow.

Previous data from sampling points situated 50 to 100 feet from shore indicate that contamination from shore generally shows up within 12 to 43 hours after a heavy rainfall.

WATER TREATMENT

Lake and river water is open to contamination by man, animals and birds (all of which can be carriers of disease); consequently, NO SURFACE WATER MAY BE CONSIDERED SAFE FOR HUMAN CONSUMPTION without prior treatment, including disinfection. Disinfection is especially critical if coliforms have been shown to be present.

Disinfection can be achieved by:

a) Boiling

Boil the water for a minimum of five minutes to destroy the disease-causing organisms.

b) Chlorination using a household bleach containing 4 to 5.1/4% Available Chlorine

Eight drops of a household bleach solution should be mixed with one gallon of water and allowed to stand for 15 minutes before drinking.

c) Continuous Chlorination

For continuous water disinfection, a small domestic hypochlorinator (sometimes coupled with activated charcoal filters) can be obtained from a local plumber or water equipment supplier.

d) Well Water Treatment

Well water can be disinfected using a household bleach (assuming strength at 5% available chlorine) if the depth of water and diameter of the well are known.

CHLORINE BLEACH

per 10 ft. depth of water

Diameter of Well Casing in Inches	One to Ten Coliforms	More than Ten Coliforms
4	.5 oz.	1 oz.
6	1 oz.	2 oz.
8	2 oz.	4 oz.
12	4 oz.	8 oz.
16	7 oz.	14 oz.
20	11 oz.	22 oz.
24	16 oz.	31 oz.
30	25 oz.	49 oz.
36	35 oz.	70 oz.

Note: Allow about six hours of contact time before using the water.

Another bacteriological sample should be taken after one week of use.

Water sources (spring, lake, well, etc.) should be inspected for possible contamination routes (surface soil, runoff following rain and seepage from domestic waste disposal sites). Attempts at disinfecting the water alone without removing the source of contamination will not supply bacteriologically safe water on a continuing basis.

There are several types of low cost filters (ceramic, paper, carbon, diatomaceous earth sometimes impregnated with silver, etc.) that can be easily installed on taps or in water lines. These may be useful to remove particles if water is periodically turbid and are usually very successful. Filters, however, do not disinfect water but may reduce bacterial numbers. For safety, chlorination of filtered water is recommended.

SEPTIC TANK INSTALLATIONS

In Ontario, provincial law requires under Part 7 of the Environmental Protection Act that before you extend, alter, enlarge or establish any building where a sewage system will be used, a Certificate of Approval must be obtained from the Ministry of the Environment or its representatives. The local municipality or Health Unit may be delegated the authority to issue the Certificate of Approval. Any other pertinent information such as size, types and location of septic tanks and tile fields can also be obtained from the same authority.

General Guidelines

A septic tank should not be closer than:

- 50 feet to any well, lake stream, pond, spring, river or reservoir.
- 5 feet to any building.
- 10 feet to any property boundary.

The tile field should not be closer than:

- 100 feet to the nearest dug well.
- 50 feet to a drilled well which has a casing to 25 feet below the ground.
- 25 feet to a building with a basement that has a floor below the level of the tile in the tile bed.
- 10 feet to any other building.
- 10 feet to a property boundary.
- 50 feet to any lake, stream, pond, spring, river or reservoir.

The ideal location for a tile field is in a well drained, sandy loam soil remote from any wells or other drinking water sources.

For the tile field to work satisfactorily, there should be at least 3 feet of soil between the bottom of the weeping tile trenches and the top of the ground water table or bedrock.

Recognizing that private sewage systems are relatively inefficient where shallow and inappropriate soil conditions are present (e.g. Pre-Cambrian areas), the Ministry of the Environment is conducting research into alternate methods of private sewage disposal in un-sewered areas; into the improvement of existing equipment and methods of design and operation for these systems; and into the development of better surveillance methods such as by the use of chemical, biological and radioactive tracers to detect the movement of pollutants through the soil mantle.

DYE TESTING OF SEPTIC TANK SYSTEMS

There is considerable interest amongst cottage owners to dye test their sewage systems, however, several problems are associated with dye testing. Dye would not be visible to the eye from a system that has a fairly direct connection to the lake. Thus, if a cottager dye-tested his system and no dye was visible in the lake, he would assume that his system is satisfactory, which might not be the case.

A low concentration of dye is not visible and, therefore, expensive equipment such as a fluorometer is required. Only qualified people with adequate equipment are capable

of assessing a sewage system by using dye. In any case, it is likely that some of the water from a septic tank will eventually reach the lake. The important question is whether all contaminants including nutrients have been removed before it reaches the lake. To answer this question special knowledge of the system, soil depth and composition, underground geology of the region and the shape and flow of the shifting water table are required. Therefore, we recommend that this type of study should be performed only by qualified professionals.

BOATING REGULATIONS

In order to help protect the lakes and rivers of Ontario from pollution, it is required by law that sewage (including garbage) from all pleasure craft, including houseboats must be retained in equipment of a type approved by the Ministry of the Environment. Equipment which will be approved by the Ministry of the Environment includes: (1) retention devices with or without circulation which retain all toilet wastes for disposal ashore, and (2) incinerating devices which reduce all sewage to ash.

To be approved, equipment shall:

1. be non-portable
2. be constructed of structurally sound material
3. have adequate capacity for expected use
4. be properly installed
5. in the case of storage devices, be equipped with the

necessary pipes and fittings conveniently located for pump-out by shore-based facilities (although not specified, a pump-out deck fitting with 1½ inch National Pipe Thread is commonly used).

An Ontario regulation requires that marinas and yacht clubs provide or arrange pump-out service for the customers and members who have toilet-equipped boats. In addition, all marinas and yacht clubs must provide litter containers that can be conveniently used by occupants of pleasure boats.

The following "tips" may be of assistance to you in regard to boating:

1. Motors should be in good mechanical condition and properly tuned.
2. When a tank for outboard motor testing is used, the contents should not be emptied into the water.
3. If the bilge is cleaned, the waste material must not be dumped into the water.
4. Fuel tanks must not be overfilled and space must be left for expansion if the fuel warms up.
5. Vent pipes should not be obstructed and fuel needs to be dispensed at a correct rate to prevent "blow-back".
6. Empty oil cans must be deposited in a leak-proof receptacle, and
7. Slow down and save fuel.

PHOSPHORUS AND DETERGENTS

Scientists have recognized that phosphorus is the key nutrient in stimulating algae and plant growth in lakes and streams.

In the past years, approximately 50% of the phosphorus

contributed by municipal sewage was added by detergents. Federal regulations reduced the phosphate content of P_2O_5 in laundry detergents from approximately 50% to 20% on August 1, 1970, and to 5% on January 1, 1973.

It should be recognized that automatic dishwashing compounds were not subject to the government regulations and that surprisingly high numbers of automatic dishwashers are present in resort areas (a questionnaire indicated that about 30 percent of the cottages in the Muskoka lakes have automatic dishwashers). Cottagers utilizing such conveniences may be contributing significant amounts of phosphorus to recreational lakes because automatic dishwashing compounds are characteristically high in phosphorus. Indeed, in most of Ontario's vacation land, the source of domestic water is soft enough to allow the exclusive use of liquid dishwashing compounds, soap and soap-flakes which are, in general, relatively low in phosphorus.

BLACKFLIES AND MOSQUITOES

These are the most bothersome, biting insects in the cottage country. Mosquitoes breed in any kind of standing water whether a roadside ditch, unemptied pails of rainwater, flat roofs or swampy areas. The simplest method for controlling mosquito larvae is making sure that all standing water in any kind of receptacle around the cottage is kept empty. The property should be laid out so that water standing in ditches is kept running, by careful drainage

planning. Swimming pools should be properly filtered and chlorinated, and eavestroughs should be kept clear of leaves. Low depressed areas that might fill with water should be filled in. In the garden areas and lawns, regular mowing of weeds and grass, trimming hedges and removing unnecessary shrubbery will help remove wind and sun protection from adult mosquitoes. To minimize bites, make sure any holes in screening are repaired, and make sure the screens are tightly sealed. Restrict outdoor activities in the evenings if at all possible, and keep the damper on your fireplace closed.

Lighter coloured clothing is less attractive to a hungry mosquito and if you're working or visiting in areas where the mosquito population is heavy, make sure to wear loose protective clothing such as long sleeved shirt, light jacket, slacks and socks. Mosquitoes are particularly bothersome at night and in dark wooded areas, during the day, so take the proper precautions and you'll suffer less.

Repellents are available in both liquid or stick form. Read the instructions carefully before using and be careful not to get the material in your eyes or mouth. The types that contain a higher concentration (in percentage) of the active ingredient will do a better job.

Blackflies are particularly bothersome in the early weeks of summer. They breed in fast-flowing watercourses so the best method of fighting them is by larviciding over a large

area. This kind of project is best managed by a community or provincial government agency. Fogging or pesticidal spraying over a large area will have temporary benefits but the practice does not justify the hazard of contamination of nearby water bodies. Complete eradication of biting fly populations can never be realized, and real control is not possible because of the limitation of funds and a lack of sufficiently trained personnel. Individual landowners may operate their own larviciding in small areas (swamps, standing water and rain pools adjacent to cottages) but it should be remembered that permits are required where the program might affect adjacent streams or lakes.

The permit must be obtained from the Pesticides Control Section, Ministry of the Environment, 1 St. Clair Ave. West, Toronto, Ontario M4V 1P5.

AQUATIC PLANT CONTROL

Many shallow lakes, such as those in the Kawartha district, provide ideal conditions for aquatic plants. These lakes are warm in summer and the profuse plant life provides an excellent habitat for sport fish species. Unfortunately, the plants pose a problem when man attempts to use the lakes for recreation. These lakes may be quite healthy, but the plants are only a "problem" when man wants to make specific use of the water.

Complete removal of the plant life is not desirable since it is important for good fishing. Some management technique is needed that will satisfy the needs of boaters, fishermen and swimmers, but that also will maintain the lake's healthy state.

PLANT HARVESTING

Mechanical harvesting has shown to be applicable to the Kawartha situation. Ministry of the Environment experiments in Chemong Lake in 1976 covered more than 1,000 acres of the lake. The fish were there, but the fisherman could not get to them because of the heavy plant growth.

Plant harvesting is a good example of a technique which satisfies man's requirements and still protects or even improves the natural lake conditions.

THE A.I.D. METHOD

Many lakes become low in oxygen in bottom waters during the summer. This results in decreased chemical quality and a loss of fish habitats. AID is simply a mechanical means of keeping the waters well mixed, thereby assuring a good distribution of oxygen in all parts of the lake. The method used experimentally by the Ministry of the Environment consisted of a shore-located compressor pumping air through a long perforated tube along the lake bottom. The bubble action caused the waters to "turn over", aerating the water.

The benefits are:

- improved chemical quality
- decrease in algae
- increased water clarity
- improved fish habitat
- reversed eutrophication effects

Trout fisheries have been restored in two experimental lakes and the techniques have been applied in at least three cases to solve particular problems.

- Heart Lake for algae control
- Valens Reservoir for algae control
- Scotch Block Reservoir for chemical water quality control

The AID method is one of the safest, cheapest and most effective lake management techniques available.


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